
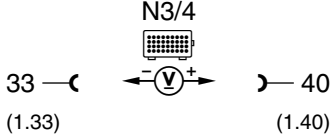
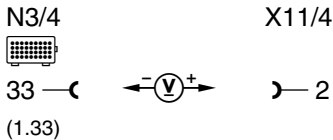
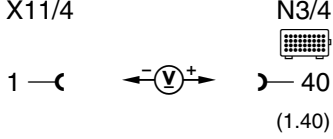


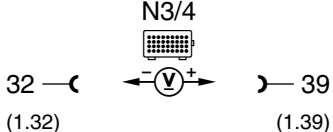
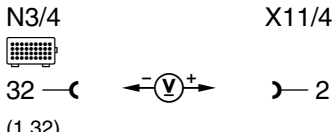
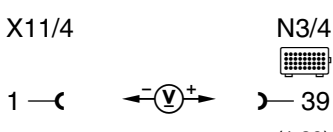
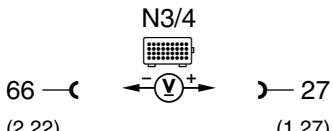
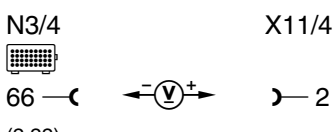


Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
1.0		<b>Engine control module (HFM-SFI) (N3/4)</b> Voltage supply Circuit 30		Ignition: <b>OFF</b>	11 – 14 V	⇒ 1.1
1.1		Ground wire		Ignition: <b>ON</b>	11 – 14 V	Ground wire, Ground (output ground - component compartment - right) - W16/4, ⇒ 1.2
1.2		Voltage supply Circuit 30		Ignition: <b>OFF</b>	11 – 14 V	Wire to terminal block X4/22.

## Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
2.0		<b>Engine control module (HFM-SFI) (N3/4)</b> Voltage supply Circuit 87	N3/4 	Ignition: <b>ON</b>	11 – 14 V	⇒ 2.1
2.1		Electronics ground	N3/4 	Ignition: <b>ON</b>	11 – 14 V	Wire, Ground (electronics ground - component compartment - right) - [W16/6] ⇒ 2.2
2.2		Voltage supply Circuit 87	X11/4 	Ignition: <b>ON</b>	11 – 14 V	Wires, Overvoltage protection relay module (K1/2), Ignition/starter switch (S2/1).
3.0		<b>Engine control module (HFM-SFI) (N3/4)</b> Voltage supply Circuit 87	N3/4 	Ignition: <b>ON</b>	11 – 14 V	Wiring, Fuse, K1/2, ⇒ 3.1.
3.1		Electronics ground	N3/4 	Ignition: <b>ON</b>	11 – 14 V	W16/6.

Electrical Test Program – Sequential Multiport Fuel Injection System Test


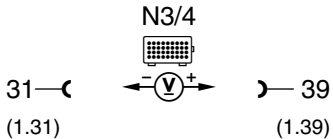
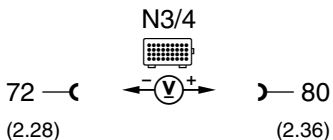
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
4.0		<b>Hot film MAF sensor (B2/5) with 4-pole connector</b> Voltage at hot film	N3/4  71 —(C) (2.27)      —(V)±      —(D) 49 (2.5)	Engine: <b>at Idle</b> Engine coolant temperature >70°C	0.8 – 1.1 V <sup>2)</sup>	Wiring, ⇒ 4.1, ⇒ 4.2, Intake air leak, B2/5.
4.1		Hot film MAF sensor (B2/5) Voltage supply	N3/4  71 —(C) (2.27)      —(V)±      —(D) 39 (1.39)	Ignition: <b>ON</b>	11 – 14 V	Wiring, N3/4.
4.2		Ground for hot film MAF sensor (B2/5)	N3/4  66 —(C) (2.22)      —(Ω)±      —(D) 71 (2.27)	Ignition: <b>OFF</b> Disconnect connector 2 on N3/4.	< 20 Ω	Ground wire.
5.0		<b>Hot film MAF sensor (B2/5) with 5-pole connector</b> Voltage at hot film	N3/4  71 —(C) (2.27)      —(V)±      —(D) 49 (2.17)	Ignition: <b>ON</b> Engine: <b>at Idle</b> Engine coolant temperature >70°C	0.9 – 1.1 V <sup>2)</sup> 1.3 – 1.7 V	Wiring, ⇒ 5.1, Intake air leak, B2/5
5.1		Hot film MAF sensor (B2/5) Voltage supply	N3/4  66 —(C) (2.22)      —(V)±      —(D) 61 (2.17)	Ignition: <b>ON</b>	4.7 – 5.2 V	Wiring, N3/4 ⇒ 5.2,

<sup>2)</sup> Voltage increases with increasing rpm.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
5.2		Ground for hot film MAF sensor (B2/5)	B2/5 3 —  — 4	Disconnect connector on B2/5 and measure directly at sockets 3 and 4. Ignition: <b>ON</b>	4.7 – 5.2 V	Fuse, Wiring, ⇒ 5.3,
5.3		Voltage supply	N3/4  66 —  — 2 (2.44) (2)	Disconnect connector on B2/5 and place positive lead directly on socket 2 (rt/bl). Ignition: <b>ON</b>	11 – 14 V	Fuse, Wiring, Relay module (K40)
6.0		<b>FP relay module (K27)</b>  Control signal	N3/4  32 —  — 29 (1.32) (1.29)	Engine: <b>Start</b>	6 – 14 V while cranking	⇒ 6.1, N3/4.
6.1		Current draw	N3/4  29 —  — 39 (1.29) (1.39)	Ignition: <b>ON</b>	0.1 – 0.3 A	Wiring, FP relay module (K27).
7.0		<b>Starter signal</b> Circuit 50	N3/4  32 —  — 21 (1.32) (1.21)	Engine: <b>Start</b>	6 – 14 V while cranking	Wiring, Ignition/starter switch (S2/1), Starter lock-out system.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy																						
8.0		Starter relay im pulse module	<p>N3/4</p> 	<p>Engine coolant temperature &gt;20°C</p> <p>Turn ignition switch briefly to position 2.</p>	6 – 14 V (or approx. 5 second duration if engine does not start)	Ignition switch, Wiring, Pulse module (N65). Engine control module N3/4																						
9.0	002 003 004 005	<b>ECT sensor (B11/3)</b> Voltage	<p>N3/4</p> 	Ignition: <b>ON</b>	<table border="0"> <tr> <td>°C</td> <td>V</td> </tr> <tr> <td>20</td> <td>3.5</td> </tr> <tr> <td>30</td> <td>3.1</td> </tr> <tr> <td>40</td> <td>2.7</td> </tr> <tr> <td>50</td> <td>2.3</td> </tr> <tr> <td>60</td> <td>1.9</td> </tr> <tr> <td>70</td> <td>1.5</td> </tr> <tr> <td>80</td> <td>1.2</td> </tr> <tr> <td>90</td> <td>1.0</td> </tr> <tr> <td>100</td> <td>0.8</td> </tr> <tr> <td></td> <td>±5 %</td> </tr> </table>	°C	V	20	3.5	30	3.1	40	2.7	50	2.3	60	1.9	70	1.5	80	1.2	90	1.0	100	0.8		±5 %	⇒ 9.1, Wiring, Engine control module (N3/4).
°C	V																											
20	3.5																											
30	3.1																											
40	2.7																											
50	2.3																											
60	1.9																											
70	1.5																											
80	1.2																											
90	1.0																											
100	0.8																											
	±5 %																											

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy																				
9.1		Resistance (B11/3)	<p>N3/4</p>	Ignition: <b>OFF</b> Unplug connector 2 on N3/4.	<table border="0"> <tr> <td>°C</td> <td>Ω</td> </tr> <tr> <td>20</td> <td>2500</td> </tr> <tr> <td>30</td> <td>1700</td> </tr> <tr> <td>40</td> <td>1170</td> </tr> <tr> <td>50</td> <td>830</td> </tr> <tr> <td>60</td> <td>600</td> </tr> <tr> <td>70</td> <td>435</td> </tr> <tr> <td>80</td> <td>325</td> </tr> <tr> <td>90</td> <td>245</td> </tr> <tr> <td></td> <td>±5 %</td> </tr> </table>	°C	Ω	20	2500	30	1700	40	1170	50	830	60	600	70	435	80	325	90	245		±5 %	Wiring, B11/3.
°C	Ω																									
20	2500																									
30	1700																									
40	1170																									
50	830																									
60	600																									
70	435																									
80	325																									
90	245																									
	±5 %																									
10.0	006 007 008	IAT sensor (B17), (B2/5) Voltage	<p>N3/4</p>	Ignition: <b>ON</b>	<table border="0"> <tr> <td>°C</td> <td>V</td> </tr> <tr> <td>10</td> <td>3.2</td> </tr> <tr> <td>20</td> <td>2.6</td> </tr> <tr> <td>30</td> <td>2.1</td> </tr> <tr> <td>40</td> <td>1.6</td> </tr> <tr> <td>50</td> <td>1.2</td> </tr> <tr> <td>60</td> <td>0.9</td> </tr> <tr> <td></td> <td>±5 %</td> </tr> </table>	°C	V	10	3.2	20	2.6	30	2.1	40	1.6	50	1.2	60	0.9		±5 %	⇒ 10.1, Engine control module (N3/4).				
°C	V																									
10	3.2																									
20	2.6																									
30	2.1																									
40	1.6																									
50	1.2																									
60	0.9																									
	±5 %																									


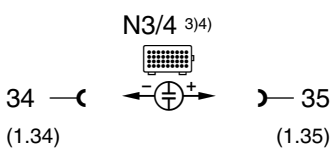
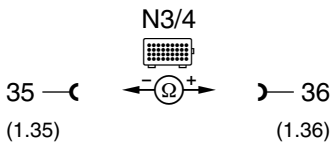
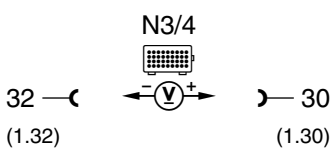
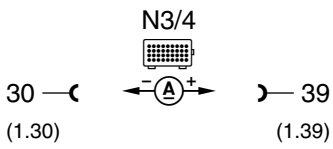
Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy																
10.1		Resistance	<p>N3/4</p> <p>72 — (2.28)      81 — (2.37)</p>	Ignition: <b>OFF</b> Unplug connector 2 on N3/4.	<table border="0"> <tr> <td>°C</td> <td>Ω</td> </tr> <tr> <td>10</td> <td>9670</td> </tr> <tr> <td>20</td> <td>6060</td> </tr> <tr> <td>30</td> <td>3900</td> </tr> <tr> <td>40</td> <td>2600</td> </tr> <tr> <td>50</td> <td>1760</td> </tr> <tr> <td>60</td> <td>1220</td> </tr> <tr> <td></td> <td>±5 %</td> </tr> </table>	°C	Ω	10	9670	20	6060	30	3900	40	2600	50	1760	60	1220		±5 %	Wiring, B17, B2/5
°C	Ω																					
10	9670																					
20	6060																					
30	3900																					
40	2600																					
50	1760																					
60	1220																					
	±5 %																					
11.0		<b>TN-signal output (engine rpm output signal) Engine control module (N3/4)</b>	<p>N3/4 <sup>3)</sup></p> <p>32 — (1.32)      18 — (1.18)</p> <p>N3/4 <sup>4)</sup></p> <p>32 — (1.32)      18 — (1.18)</p>	Engine: <b>Start</b> or Engine: <b>at Idle</b>	<p>Signal, see Figure 1.</p> <p>5 – 7.5 V</p>	Wiring, CKP sensor (L5) Engine control module (N3/4).																
12.0		<b>Non-USA vehicles only. Continue to next test step.</b>																				
12.1		<b>Non-USA vehicles only. Continue to next test step.</b>																				

3) Test with oscilloscope.

4) Test with multimeter only if oscilloscope is not available.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
13.0	023 024 025	<b>O2S 1 (before TWC) (G3/2)</b> O2S 1 signal	N3/4 <sup>3)4)</sup>  34 —◀ (1.34)    ▶— 35 (1.35)	Engine: <b>at Idle</b> and at operating temperature > 80 °C let engine run for a minimum of 2 minutes.	Oscillates between –0.2 and +1.0 V by more than 0.3 Figure 14	Wiring, O2S 1 (G3/2), ⇒ 13.1, ⇒ 14.0
13.1		Insulation, O2S 1 wire	N3/4  35 —◀ (1.35)    ▶— 36 (1.36)	Ignition: <b>OFF</b> Unplug connector 1 on N3/4.	>20 kΩ	Wiring.
14.0	029 030 031	<b>O2S 1 (before TWC) (G3/2)</b> O2S 1 heater Control signal	N3/4  32 —◀ (1.32)    ▶— 30 (1.30)	Engine: <b>at Idle</b> and at operating temperature > 80 °C let engine run for a minimum of 2 minutes.	11 – 14 V or voltage changes between 1 – 14 V	Engine control module (N3/4), ⇒ 14.1
14.1		Current draw	N3/4  30 —◀ (1.30)    ▶— 39 (1.39)	Ignition: <b>ON</b>	0.6 – 3.4 A	Wiring, O2S 1 (G3/2).


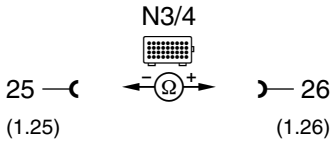
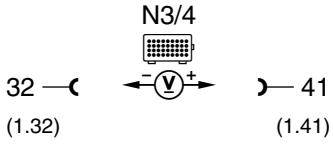
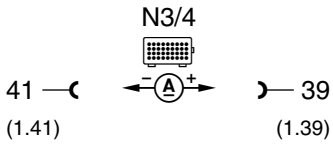
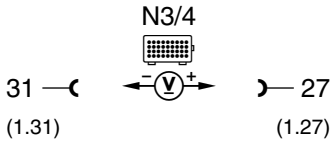
3) Test with oscilloscope.

4) Test with multimeter only if oscilloscope is not available.


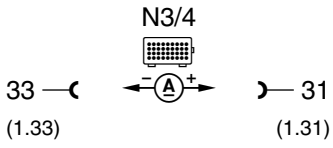

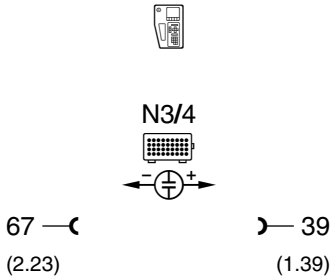
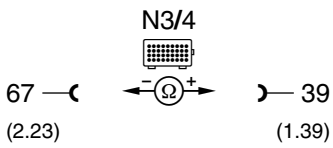










## Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
15.1	029 030 031	Insulation, O2S 2 wire		Ignition: <b>OFF</b> Unplug connector 1 on N3/4.	>20 kΩ	Wiring.
16.0	032 033 034	<b>O2S 2 (after TWC) (G3/1)</b> O2S 2 heater Control signal		Engine: <b>at Idle</b> and at operating temperature > 80 °C let engine run for a minimum of 2 minutes.	11 – 14 V	⇒ 16.1, Engine control module (N3/4).
16.1		Current draw		Ignition: <b>ON</b>	0.6 – 3.4 A	Wiring, O2S 2 (after TWC) heater relay module (K35) O2S 2 (G3/1).
17.0	108 109	<b>O2S 2 (after TWC) heater relay module (K35)</b> Control signal		Disconnect ECT sensor (B11/3) and simulate 2.5 kΩ at sockets 1 and 2 with resistance substitution unit. Engine: <b>at Idle</b>	11 – 14 V	⇒ 17.1, N3/4.





Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
17.1		Current draw	 <p>33 — (1.33)      31 — (1.31)</p>	Ignition: <b>ON</b>	0.1 – 0.3 A	Wiring, K35.
18.0		<b>Injector (Y62y1)</b> Control and injection time	 <p>67 — (2.23)      39 — (1.39)</p>	<b>ECT approx. 20 °C</b> at start →  <b>ECT approx. 80 °C</b> at idle → accelerate briefly →	Injection time: approx. 8 ms  approx. 3 – 5 ms approx. 17 ms (see signals, Figures 2 and 3)	⇒ 18.1, N3/4.  <b>Further possible causes:</b> ECT sensor (B11/3), IAT sensor (B17), O2S 1 (G3/2).
18.1		Resistance	 <p>67 — (2.23)      39 — (1.39)</p>	Ignition: <b>OFF</b> Connector 2 on engine control module unplugged.	14 – 17 Ω	Wiring, Y62y1.







Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
19.0	 	<b>Injector (Y62y2)</b> Control and injection time	    68 —┘ (2.24)                      ┘— 39 (1.39)	<b>ECT approx. 20 °C</b> at start →  <b>ECT approx. 80 °C</b> at idle → accelerate briefly →	Injection time: approx. 8 ms  approx. 3 – 5 ms approx. 17 ms (see signals, Figures 2 and 3)	⇒ 19.1, N3/4.  <b>Further possible causes:</b> ECT sensor (B11/3), IAT sensor (B17), O2S 1 (G3/2).
19.1		Resistance	  68 —┘ (2.24)                      ┘— 39 (1.39)	Ignition: <b>OFF</b> Connector 2 on engine control module unplugged.	14 – 17 Ω	Wiring, Y62y2.


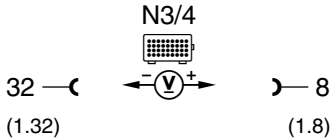
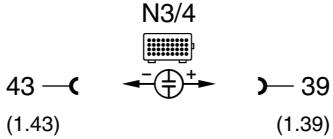
Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
20.0	041 042	<b>Injector (Y62y3)</b> Control and injection time	   56 —┐ (2.12)                      ┘— 39 (1.39)	<b>ECT approx. 20 °C</b> at start →  <b>ECT approx. 80 °C</b> at idle → accelerate briefly →	Injection time: approx. 8 ms  approx. 3 – 5 ms approx. 17 ms (see signals, Figures 2 and 3)	⇒ 20.1, N3/4.  <b>Further possible causes:</b> ECT sensor (B11/3), IAT sensor (B17), O2S 1 (G3/2).
20.1		Resistance	 56 —┐ (2.12)                      ┘— 39 (1.39)	Ignition: <b>OFF</b> Connector 2 on engine control module unplugged.	14 – 17 Ω	Wiring, Y62y3.


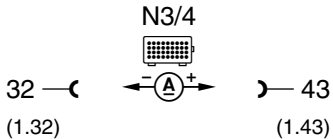
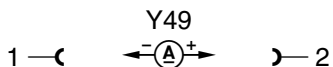
Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
21.0	 	<b>Injector (Y62y4)</b> Control and injection time	   46 —┘ (2.2)                      ┘— 39 (1.39)	<b>ECT approx. 20 °C</b> at start →  <b>ECT approx. 80 °C</b> at idle → accelerate briefly →	Injection time: approx. 8 ms  approx. 3 – 5 ms approx. 17 ms (see signals, Figures 2 and 3)	⇒ 21.1, N3/4.  <b>Further possible causes:</b> ECT sensor (B11/3), IAT sensor (B17), O2S 1 (G3/2).
21.1		Resistance	 46 —┘ (2.2)                      ┘— 39 (1.39)	Ignition: <b>OFF</b> Connector 2 on engine control module unplugged.	14 – 17 Ω	Wiring, Y62y4.

Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
22.0	068 069	<i>Non-USA vehicles only. Continue to next test step.</i>				
22.1		<i>Non-USA vehicles only. Continue to next test step.</i>				
23.0	077 078	<i>Non-USA vehicles only. Continue to next test step.</i>				
23.1		<i>Non-USA vehicles only. Continue to next test step.</i>				
24.0	072 073	<b>Vehicle speed signal (VSS)</b> ABS control module	<p>N3/4</p>  <p>32 — (1.32)      — 8 (1.8)</p>	Raise rear of vehicle. Ignition: <b>ON</b> Turn one rear wheel by hand.	>3 V	Wire from ABS control module to engine control module (N3/4), Rear axle VSS sensor (L6) (Test, see SMS, Brakes - ABS).
25.0	086 087	<b>Purge control valve (Y58/1)</b> Control signal	<p>N3/4</p>  <p>43 — (1.43)      — 39 (1.39)</p>	Engine: <b>at Idle</b> and at operating temperature.	After approx. 1 min, purge control valve (Y58/1, Figure 5) must cycle noticeably (signal, see Figure 4).	⇒ 25.1, ⇒ 26.0, N3/4.

Electrical Test Program – Sequential Multiport Fuel Injection System Test


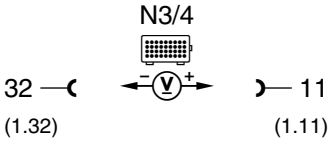
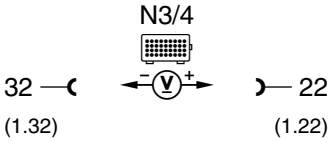
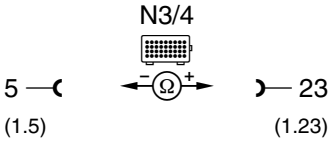
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
25.1	086 087	Current draw		Ignition: <b>ON</b>	0.2 – 0.3 A	Fuse, Wiring, Y58/1.
26.0		<b>Purge control valve (Y58/1)</b>  Vacuum control		<b>Note to test connection:</b> Connect vacuum tester to Y58/1 (Figure 5), connection (A).  Engine: <b>at Idle</b> and at operating temperature.	After approx. 1 minute, > 400 mbar	Vacuum lines, Y58/1.
27.0	089 090	<b>Adjustable camshaft timing solenoid (Y49)</b> Current draw		<b>Note to test connection:</b> Connect test cable (102 589 04 63 00) to solenoid. Engine: <b>at Idle</b> and accelerate engine briefly.	1 – 1.5 A,	⇒ 28.0, Engine control module (N3/4).
27.1		<b>Non-USA vehicles only.</b> <b>Continue to next step.</b>				



Electrical Test Program – Sequential Multiport Fuel Injection System Test




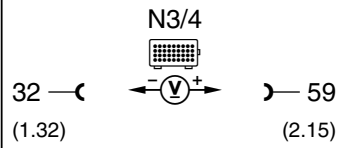
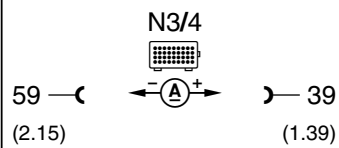

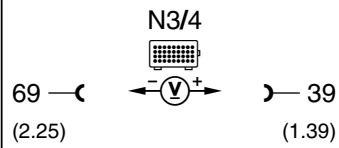
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
27.2		<b>Non-USA vehicles only.</b> <b>Continue to next step.</b>				
27.3		<b>Non-USA vehicles only.</b> <b>Continue to next step.</b>				
28.0		<b>Adjustable camshaft timing solenoid</b> Mechanical operation	<p>N3/4 </p> <p>45 (2.1) ←  → 66 (2.22)</p>	Engine: <b>at Idle</b> Bridge socket box sockets for maximum of 10 seconds.	Engine runs unevenly or stalls.	Mechanical camshaft adjustment (see SMS, Engine 111, Job No. 05–2160).
29.0		<b>Upshift delay switchover valve (Y3/3)</b> Current draw	<p>N3/4 </p> <p>42 (1.42) ←  → 39 (1.39)</p>	Ignition: <b>ON</b>	0.4 – 0.6 A	Wiring, Y3/3, ⇒ 30.0.
30.0		<b>Pneumatic upshift delay</b> Vacuum control and sealing	<p>N3/4 </p> <p>42 (1.42) ←  → 39 (1.39)</p>	<b>Note to test connection:</b> Connect vacuum tester to upshift delay switchover valve (Y3/3) according to Figure 6.  Engine: <b>at Idle</b>	> 400 mbar	Vacuum lines, Y3/3.

Electrical Test Program – Sequential Multiport Fuel Injection System Test


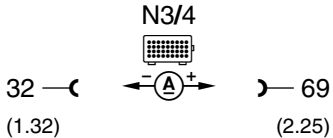
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
31.0		<b>A/C compressor engagement signal</b>		Engine: <b>at Idle</b> A/C system: <b>ON</b>	11 – 14 V	Wiring, A/C pushbutton control module (N22).
32.0		<b>Cruise control ON recognition</b>		Test condition <sup>5)</sup> Cruise control switch: <b>Accelerate</b>  <b>OFF</b> or apply brake pedal	11 – 14 V  <1 V	Wiring, Cruise control switch (S40).
33.0		<b>Non-USA vehicles only. Continue to next test step.</b>				
34.0		<b>Non-USA vehicles only. Continue to next test step.</b>				
35.0		<b>Transmission range 2/3 recognition</b>		Ignition: <b>OFF</b> Unplug connector 1 on engine control module (N3/4). Transmission range: D→ 2 – 3→	>20 kΩ <1 Ω	Wiring, Starter lock-out/backup lamp switch (S16/1).

<sup>5)</sup> Drive vehicle above 25 mph (40 km/h) on dynamometer.

Electrical Test Program – Sequential Multiport Fuel Injection System Test



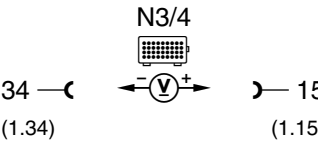
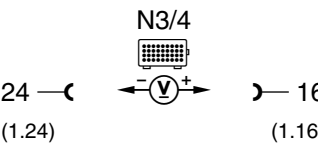
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
36.0		<b>Non-USA vehicles only.</b> Continue to next test step.				
37.0		<b>Non-USA vehicles only.</b> Continue to next test step.				
37.1		<b>Non-USA vehicles only.</b> Continue to next test step.				
38.0		<b>AIR pump switchover valve (Y32) and/or AIR relay module (K17)</b>		Disconnect ECT sensor (B11/3) and simulate 2.5 kΩ at sockets 1 and 2 with resistance substitution unit, Engine: <b>at Idle</b>	11 - 14 V for approx. 2 minutes and AIR pump runs.	N3/4.
38.1		Current draw		Ignition: <b>ON</b>	0.4 – 0.7 A	Wires, Y32, K17.
39.0		<b>EGR switchover valve (Y27)</b> Vacuum control		Engine: <b>at Idle</b> Engine coolant temperature > 60 °C Briefly apply full throttle.	11 – 14V	⇒ 39.1, N3/4, ⇒ 40.0 – 41.0

Electrical Test Program – Sequential Multiport Fuel Injection System Test


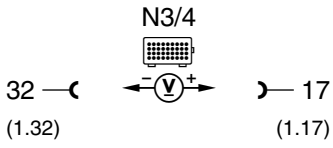
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
39.1		Current draw		Ignition: <b>ON</b>	0.3-0.5 A	Fuse, Wiring, Y27.
40.0		<b>EGR switchover valve (Y27)</b> Vacuum control		<p><b>Note to test connection:</b> Connect vacuum tester to the EGR valve (Figure 7).</p> <p>Engine control module (N3/4) plugged in. Engine: <b>Start</b> and run at &gt; 3000 rpm.</p>	> 400 mbar	Vacuum lines, EGR valve, Y27.
41.0		<b>EGR valve</b> Mechanical test		<p><b>Note to test connection:</b> Connect vacuum tester to the EGR valve (Figure 11).</p> <p>Engine: <b>at Idle</b> Apply 500 mbar vacuum with vacuum tester.</p> <p>Engine: <b>OFF</b> Apply 500 mbar vacuum with vacuum tester and pull off vacuum line.</p>	<p>Engine runs unevenly</p> <p>EGR valve closes audibly</p>	EGR valve.



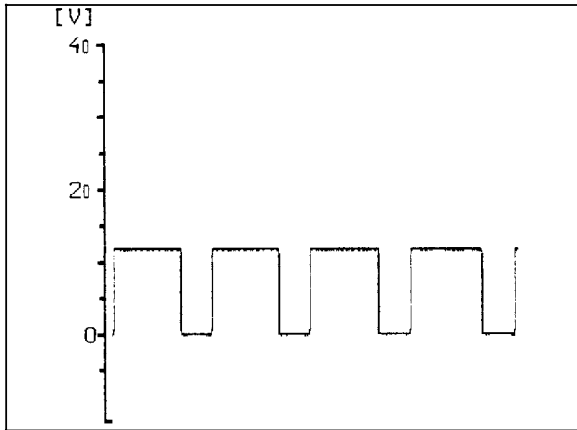
Electrical Test Program – Sequential Multiport Fuel Injection System Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
43.0	097	<b>CAN element in engine control module (N3/4)</b> Resistance		Ignition: <b>OFF</b> Unplug connector 1 on N3/4 and measure resistance directly at engine control module (Figure 12)	55 – 65 Ω	N3/4.
44.0		<b>O2S 1 (before TWC) (G3/2)</b> O2S signal for Diagnostic Module (OBD II) (N59/1)		Engine: <b>at Idle</b> and at operating temperature > 80 °C. Allow engine to run for a minimum of 2 minutes.	Oscillates in range between -0.2 and +1.0 V by more than 0.3 V	Wiring, N3/4.
45.0		<b>O2S 2 (after TWC) (G3/1)</b> O2S signal for Diagnostic Module (OBD II) (N59/1)		At operating temperature > 80 °C start engine and run at 2000 – 3000 rpm for a minimum of 3 minutes.  Accelerate briefly.	450 mV constant.  Voltage fluctuates.  Voltage fluctuates by >100 mV	Wiring, N3/4.

## Electrical Test Program – Sequential Multiport Fuel Injection Test

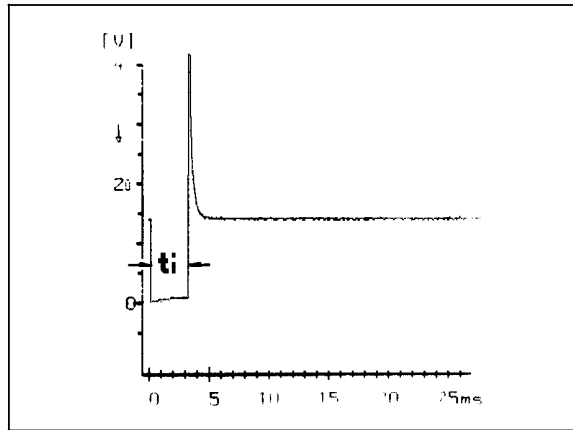
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
46.0		<b>CMP sensor (L5/1)</b> Signal for Diagnostic Module (OBD II) (N59/1)		Engine: <b>at Idle</b>	9.5 – 10.5 V	Wiring, N3/4.
47.0	118	<b>Non-USA vehicles only.</b> <b>Continue to next test step.</b>				
48.0	119	<b>Non-USA vehicles only.</b> <b>Continue to next test step.</b>				
48.1	123 124	<b>Non-USA vehicles only.</b> <b>Continue to next test step.</b>				
49.0	123 124	<b>Non-USA vehicles only.</b> <b>Continue to next test step.</b>				
50.0		<b>Non-USA vehicles only.</b> <b>Continue to next test step.</b>				
51.0	153 154	<b>Non-USA vehicles only.</b> <b>Continue to next test step.</b>				

Electrical Test Program – Sequential Multiport Fuel Injection System Test



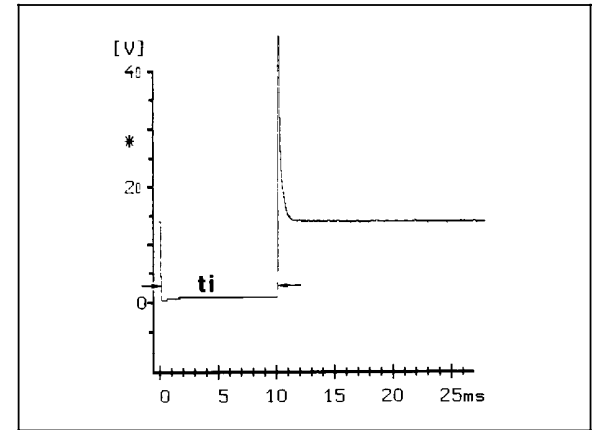
P15-0370-13

Figure 1  
TN signal (engine rpm)



P07-0699-13

Figure 2  
Injection time signal "ti" of injectors at idle speed

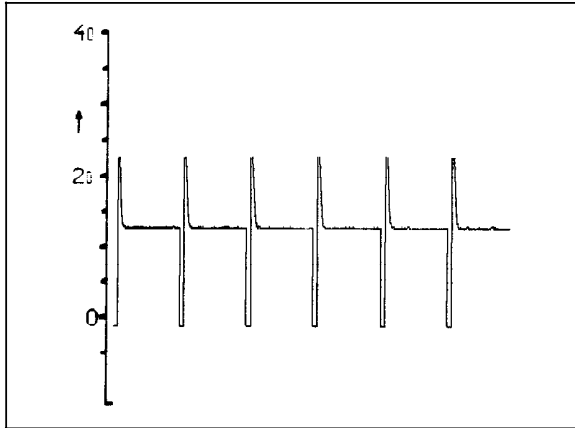


P07-0700-13

Figure 3  
Injection time signal "ti" of injectors when briefly accelerating

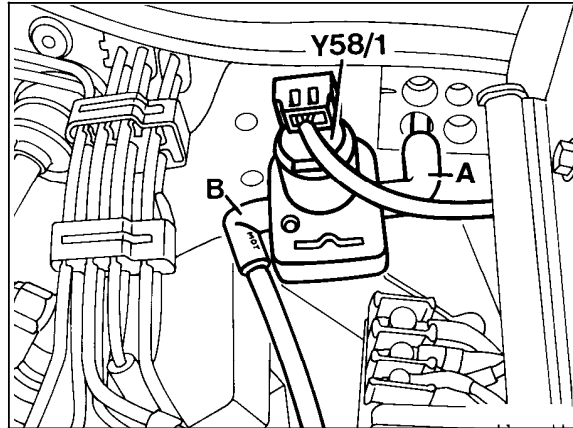


Electrical Test Program – Sequential Multiport Fuel Injection System Test



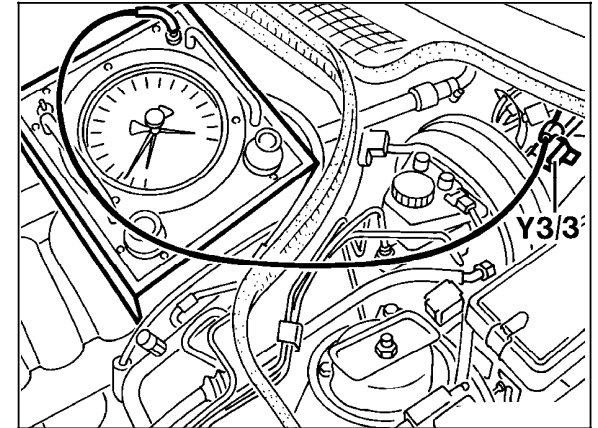
P07-5330-13

Figure 4  
Purge control valve signal



P07-5455-13

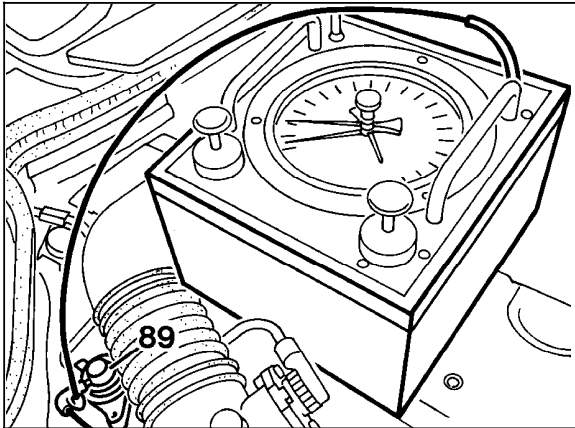
Figure 5  
Y58/1 Purge control valve  
A Line to charcoal canister  
B Line to engine



P07-5735-13

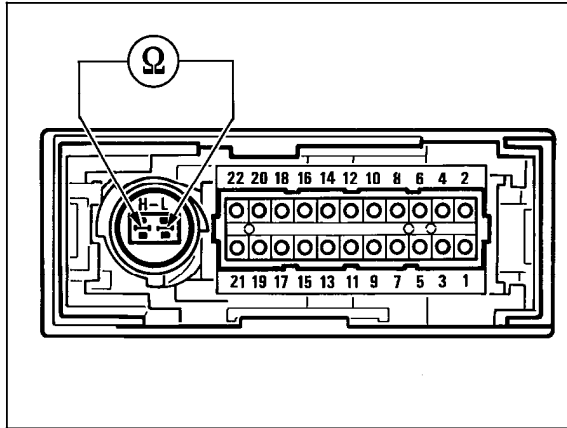
Figure 6  
Y3/3 Upshift delay switchover valve

Electrical Test Program – Sequential Multiport Fuel Injection System Test



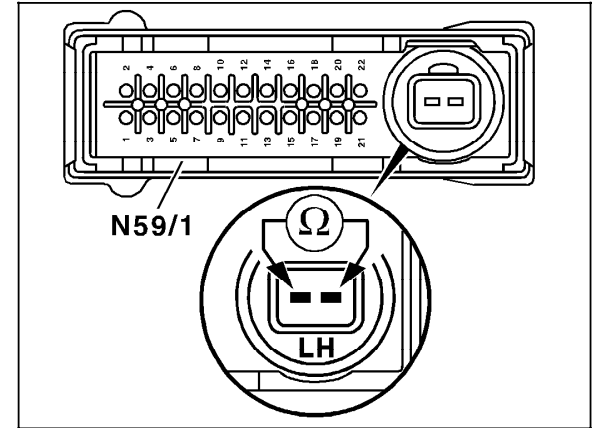
P07-5733-13

Figure 7  
89 EGR valve



P07-5787-13

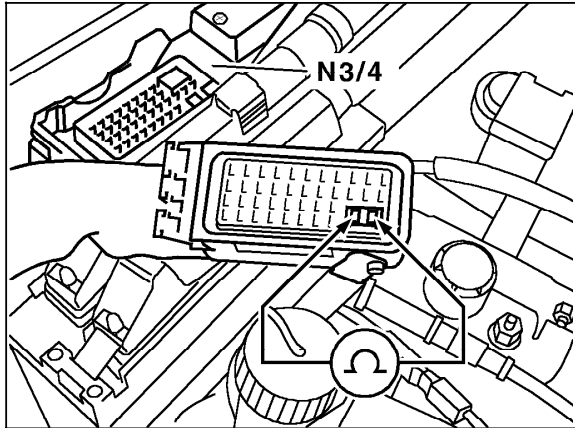
Figure 8  
Serial data bus (CAN)



P07.51-0554-01

Figure 9  
Serial data bus (CAN)  
N59/1 Diagnostic Module (OBD II)

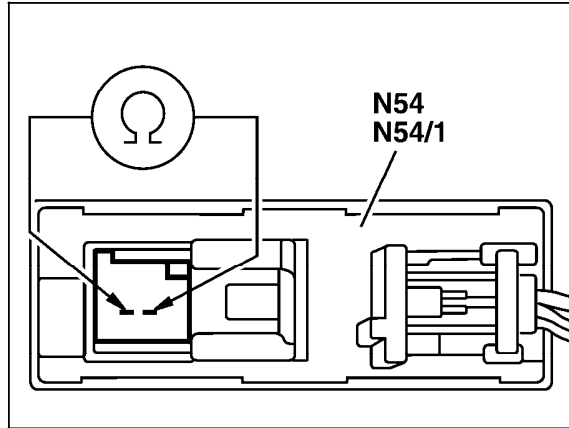
Electrical Test Program – Sequential Multiport Fuel Injection System Test



P07.51-0555-01

Figure 10

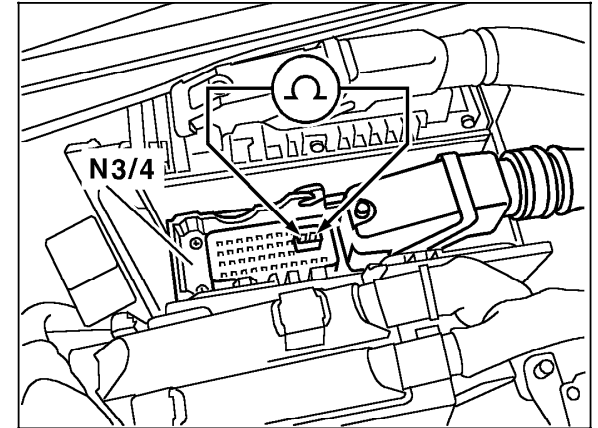
N3/4 Engine control module (HFM-SFI)



P07.51-0426-13

Figure 11

N54 RCL control module



P07.51-0556-01

Figure 12

N3/4 Engine control module (HFM-SFI)

Electrical Test Program – Sequential Multiport Fuel Injection System Test

Function diagram, purge system monitoring/pressure switchover

- 3 Intake manifold
- 75 Fuel tank
- 76 Vent valve
- 77 Charcoal canister
- B5/2 Diagnostic pressure sensor
- N3/4 Engine control module
- N59/1 Diagnostic module (OBDII)
- Y27/6 Purge-flow switchover valve
- Y58/1 Purge switchover valve
- a Barometric pressure

With voltage applied to the purge-flow switchover valve (Y27/6), the diagnostic pressure sensor is connected to the purge switchover valve (Y58/1).

With no voltage applied to the purge-flow switchover valve (Y27/6), the diagnostic pressure sensor is connected to the intake manifold (3).

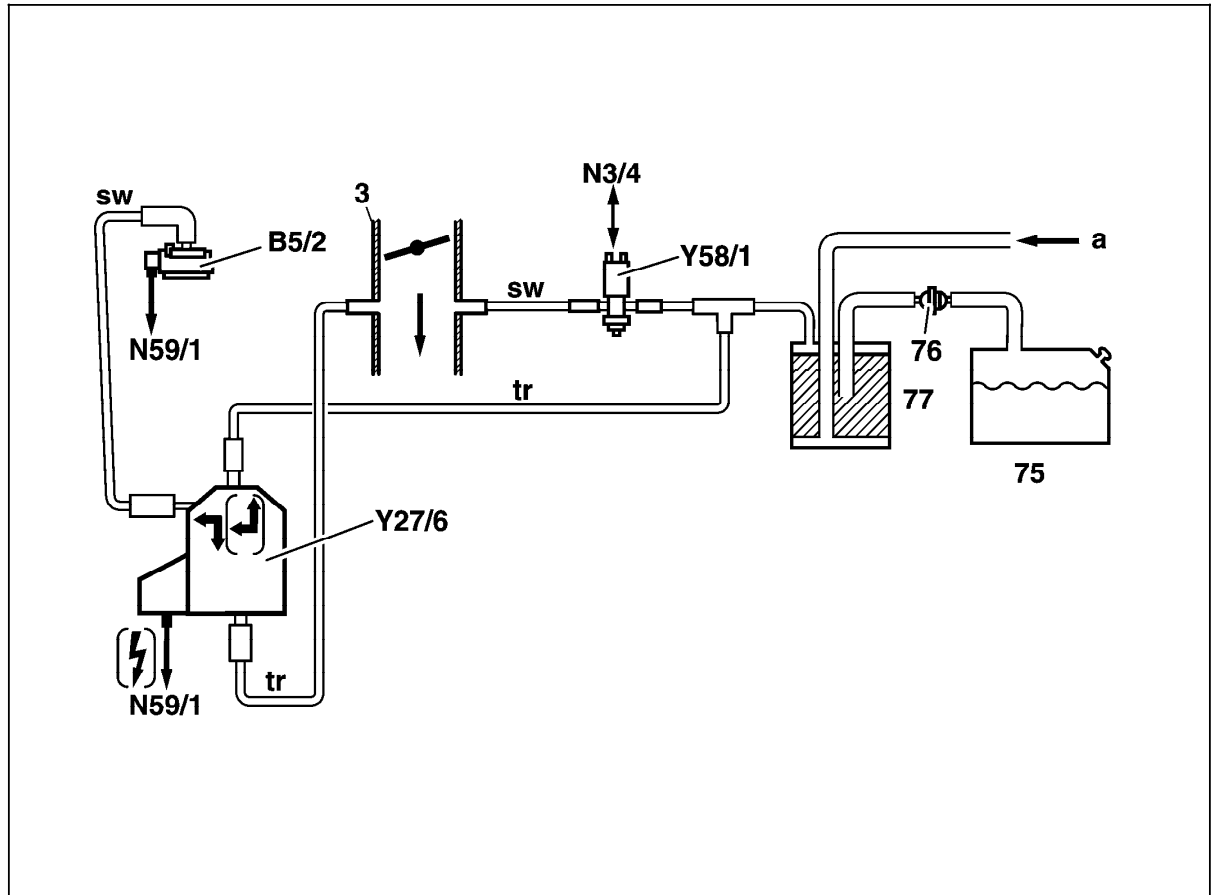


Figure 13

P47.30-2021-05

Electrical Test Program – Sequential Multiport Fuel Injection System Test

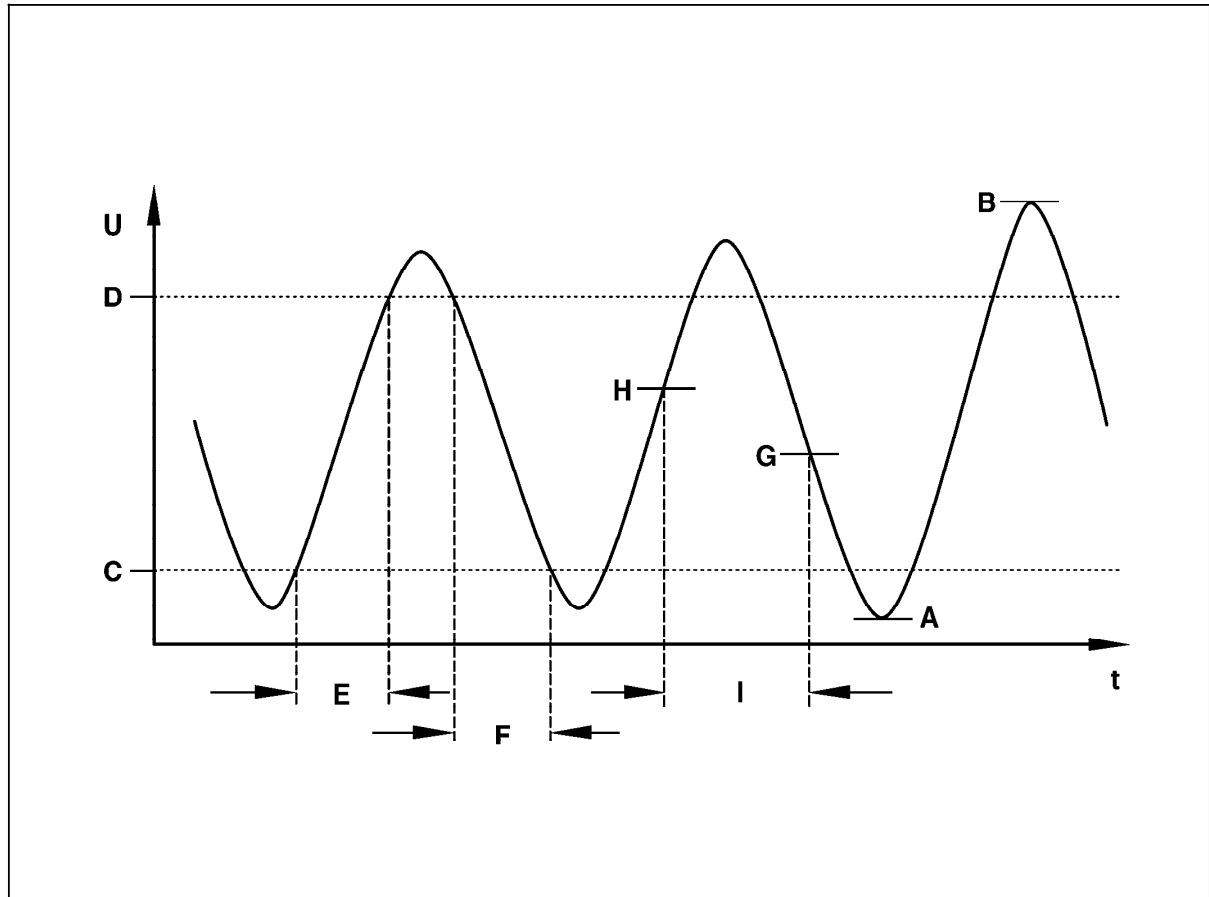
O2S signal

- A minimum sensor voltage
- B maximum sensor voltage
- C lower limit for time measurement (E,F)
- D upper limit for time measurement (E,F)
- E time from lean to rich
- F time from rich to lean
- G predetermined threshold for lean range ( $\leq 425$  mV)
- H predetermined threshold for rich range ( $\geq 425$  mV)
- I total time of one regulating period
- U = voltage
- t = time

At an engine speed of approximately 2500 rpm following conditions must be met:

- A greater than approximately 100 mV
- B smaller than approximately 1280 mV
- C greater than 200 mV
- D smaller than 700 mV
- E smaller than approximately 20 ms
- F smaller than approximately 20 ms
- G smaller than 425 mV
- H greater than 475 mV
- I smaller than approximately 700 ms

Test O2S (G3/1, G3/2) using an oscilloscope. Connect at test connector (X11/22) on diagnostic module.



P07.51-2050-05

Figure 14